

D6.14 COMPILATION OF PUBLICATIONS ABSTRACTS (V1) OPERATIONAL SUSTAINABLE FORESTRY WITH SATELLITE-BASED REMOTE SENSING

Project no.	776045
Project title	Operational sustainable forestry with satellite-based remote sensing
Project acronym	MySustainableForest
Start date of project	1 November 2017
Duration of project	36 months
Deliverable	D23 D6.14
Due date of deliverable	30/03/2019
Actual submission date	18/04/2019
Organisation name of lead contractor for this deliverable	CFRI EC REA
Dissemination level	PU



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776045

Code:	D23 D6.14
Version:	V1
Date:	18/04/2019
Internal code:	GMV 20606/19 V1/19

TECHNICAL REFERENCES

Project Acronym	MySustainableForest
Project Title	Operational sustainable forestry with satellite-based remote sensing
Project Coordinator	Julia Yagüe GMV mjyague@gmv.com
Project Duration	1 Nov 2011 – 30 Oct 2021 (36 months)
Grant Agreement	No. 776045

Deliverable Number	D23 D6.14
Dissemination Level	PU
Workpackage	WP6 Outreach, Dissemination and Exploitation
Task	Task 6.1 Communication
Lead beneficiary	CFRI
Contributing beneficiary (ies)	GMV AD, GUK, RAIZ, CFRI, UFE, FORESNA, FOAL, CNPF, MADERA+, FORA, EFI
Due date of deliverable	30/03/2019
Actual submission date	18/04/2019

COPYRIGHT NOTICES

©2017 MY SUSTAINABLE FOREST CONSORTIUM PARTNERS. ALL RIGHTS RESERVED. MY SUSTAINABLE FOREST IS A HORIZON2020 PROJECT SUPPORTED BY THE EUROPEAN COMMISSION UNDER CONTRACT NO. 774652. FOR MORE INFORMATION ON THE PROJECT, ITS PARTNERS AND CONTRIBUTORS, PLEASE SEE THE MY SUSTAINABLE FOREST WEBSITE. YOU ARE PERMITTED TO COPY AND DISTRIBUTE VERBATIM COPIES OF THIS DOCUMENT, CONTAINING THIS COPYRIGHT NOTICE, BUT MODIFYING THIS DOCUMENT IS NOT ALLOWED. ALL CONTENTS ARE RESERVED BY DEFAULT AND MAY NOT BE DISCLOSED TO THIRD PARTIES WITHOUT THE WRITTEN CONSENT OF THE MY SUSTAINABLE FOREST PARTNERS, EXCEPT AS MANDATED BY THE EUROPEAN COMMISSION CONTRACT, FOR REVIEWING AND DISSEMINATION PURPOSES. ALL TRADEMARKS AND OTHER RIGHTS ON THIRD PARTY PRODUCTS MENTIONED IN THIS DOCUMENT ARE ACKNOWLEDGED AND OWNED BY THE RESPECTIVE HOLDERS. THE INFORMATION CONTAINED IN THIS DOCUMENT REPRESENTS THE VIEWS OF MY SUSTAINABLE FOREST MEMBERS AS OF THE DATE THEY ARE PUBLISHED. THE MY SUSTAINABLE FOREST CONSORTIUM DOES NOT GUARANTEE THAT ANY INFORMATION CONTAINED HEREIN IS ERROR-FREE, OR UP-TO-DATE, NOR MAKES WARRANTIES, EXPRESS, IMPLIED, OR STATUTORY, BY PUBLISHING THIS DOCUMENT.

DOCUMENT STATUS SHEET

Version	Date	Pages	Changes
V1	18/04/2019	20	Advanced Draft version of the document to PO

TABLE OF CONTENTS

1. INTRODUCTION	6
1.1. PURPOSE.....	6
1.2. SCOPE.....	6
2. APPLICABLE AND REFERENCE DOCUMENTS	7
2.1. APPLICABLE DOCUMENTS	7
2.2. REFERENCE DOCUMENTS.....	7
2.3. ACRONYMS AND DEFINITIONS.....	7
3. PUBLICATIONS	8
3.1. GMV	8
3.2. RAIZ	9
3.3. CFRI	11
3.4. UFE	14
3.5. FORESNA.....	14
3.6. FOAL.....	15
3.7. CNPF.....	15
3.8. MADERA+	15
3.9. FOR A	18
3.10. EFI.....	19

LIST OF TABLES AND FIGURES

Table 2-2.Applicable Documents.....	7
Table 2-3.Reference Documents.....	7
Table 2-4. Acronyms.....	7

1. INTRODUCTION

1.1. PURPOSE

MySustainableForest project (H2020 projectID No. 776045) seeks the provision of geo-information services for integrated forest management, at pre-commercial stage, through a web service platform. Services combine in-situ data, satellite images from Copernicus satellite missions and other, LIDAR, airborne data and sound wave wood quality data. Services address issues beyond wood production and industrial transformation, such as: forest conservation, needs and requirements relative to climate change adaptation measurements, guidelines for national forests plans, national reporting obligations to the EU, biomass and CO₂ stock counts, long lasting drought impacts, rising public awareness with reference to these new technologies in the wood sector. These issues are part of the demonstration cases in Portugal, Spain, France, Croatia, the Czech Republic and Lithuania, across Atlantic, Mediterranean and continental forest types. Data sets cover the needs of 14 areas of interest (AOIs) in 6 countries.

This document corresponds to Deliverable **D6.14 Compilation of Publications Abstracts (v1)**. The goal of this document is to justify a strategy for communication during the project timeframe with the involvement of stakeholders and coordinated with project partners.

1.2. SCOPE

This document is structured according to the following sections:

- Section 1, (present chapter) introduces the purpose of the document, the project overview, etc.
- Section 2 recalls the applicable and reference documents
- Section 3 includes the list of the publication abstracts of My Sustainable Forest project

2. APPLICABLE AND REFERENCE DOCUMENTS

2.1. APPLICABLE DOCUMENTS

The following documents, of the exact issue shown, form part of this document to the extent specified herein. Applicable documents are those referenced in the Contract or approved by the Approval Authority.

Table 2-1. Applicable Documents

Ref.	Title	Code	Version	Date
[AD.1]	Grant Agreement N° 776045—MySustainableForest	Ares(2017)5215238	1.0	25/10/2017
[AD.2]	D01_D1.1_Project Plan	D01_D1.1	1.0	30/11/2017

2.2. REFERENCE DOCUMENTS

The following documents, although not part of this document, amplify or clarify its contents. Reference documents are those not applicable and referenced within this document. They are referenced in this document in the form [RD.X]:

Table 2-2. Reference Documents

Ref.	Title	Code	Version	Date
[RD.1]	H2020 Programme. AGA - Annotated Model Grant Agreement ec.europa.eu/research/participants/data/ref/h2020/grants_manual/amga/h2020-amga_en.pdf#page=227	COPE-PMAN-EOPG-TN-15-0004	4.1	26/10/2017

2.3. ACRONYMS AND DEFINITIONS

The following acronyms have been used across this document:

Table 2-3. Acronyms

Acronym	Full term
AOI	Area of Interest
EC	European Commission
ESA	European Space Agency
EU	European Union
CSCDA	Copernicus Space Component Data Access
DAP	Data Access Portfolio
DWH	Data WareHouse
HR	High Resolution
MSF	My Sustainable Forest
SAR	Synthetic Aperture Radar
VHR	Very High Resolution

3. PUBLICATIONS

3.1. GMV

Presentation title: A Sentinel-2 unsupervised forest mask for European sites

Authors with affiliation: A. Fernandez-Carrillo^a, D. de la Fuente^a, F. W. Rivas-Gonzalez^a, A. Franco-Nieto^a

^aRemote Sensing Services and Exploitation Platforms Division, GMV Aerospace and Defence, C/ Isaac Newton 11, 28760 Tres Cantos (Madrid), Spain

Presentation type: Oral or Poster (depending on acceptance), proceedings paper

Date of publication: Planned for September 2019

Journal/event: SPIE Remote Sensing 2019 Conference (<http://spie.org/conferences-and-exhibitions/remote-sensing?SSO=1>)

Presentation focus on WP activity/task: WP2, WP3 and WP4

web link: Still unavailable

Abstract:

Forests cover one third of Europe's land and significantly contribute to the regional economy. Forest benefits include both tangible and intangible counts. Traditional inventory-based forest data update is often much lower than required. Remote Sensing is a valuable source for forest monitoring, as it provides periodic and spatially continuous data on vegetation status. In this context, MSF aims at developing remote sensing-derived geo-information services for integrated forest management through a web service platform.

An automatic unsupervised method to obtain a forest mask for Europe using Sentinel-2 data was implemented. K-means clustering algorithm was used for segmenting the images in 5 clusters, which were subsequently assigned to a forest class if more than 45% of its area overlapped the forest classes of ancillary land cover data. The resulting classification was refined applying a sieve filter and a vegetation mask. This product was applied over 16 different sites. A confusion matrix was built using polygons delimited via photointerpretation and validation metrics were computed.

The results showed that it is possible to develop an automatic forest mask, with an accuracy above 90%. Different locations yielded variable accuracies. Best results were achieved in Boreal and Continental forests. Although the algorithm was tuned to consider the diversity of European forests, there is scope for improving the adaptability of MSF Forest Mask, mainly in southern Mediterranean region, where the mixed effect of tree-grass formations hindered a better forest discrimination.

Presentation title: An automatic Sentinel-2 forest types classification over the Roncal Valley, Navarra (Spain)

Authors with affiliation: A. Fernandez-Carrillo^a, D. de la Fuente^a, F. W. Rivas-Gonzalez^a, A. Franco-Nieto^a

^aRemote Sensing Services and Exploitation Platforms Division, GMV Aerospace and Defence, C/ Isaac Newton 11, 28760 Tres Cantos (Madrid), Spain

Presentation type: Poster and proceedings paper

Date of publication: Planned for September 2019

Journal/event: SPIE Remote Sensing 2019 Conference (<http://spie.org/conferences-and-exhibitions/remote-sensing?SSO=1>)

Presentation focus on WP activity/task: WP2, WP3 and WP4

web link: Still unavailable

Abstract:

Forests cover more than 50 % of Spanish land. Natural and man-induced disturbances are inducing important changes in species distribution. As Spanish National Forest Inventory is updated every 10 years, a periodic data source providing information on species distribution is needed in order to predict changes in forest area and composition. Remote Sensing (RS) meets this demand, as it provides periodic and spatially continuous data on forest status. In this context, MySustainableForest project aims at developing geo-information services through a web service platform.

One of MSF products is a classification of main forest types, whose preliminary development was tested in Roncal Valley (Spain), which is divided in three bioclimatic zones (Mediterranean, Atlantic and Alpine). A Random Forest model was trained with data delineated with the help of local forest data. Validation metrics were computed from a confusion matrix for each class separately and for the total set of classes. Results in the three bioclimatic zones were compared.

Although overall metrics were high (OA = 0.95; DC = 0.84), they varied significantly for different classes (e.g., *Fagus sylvatica* was classified with higher accuracy than *Pinus nigra*, which was mainly confused with other *Pinus* species), showing that species with higher seasonal variations were easier to identify. Results were different depending on bioclimatic zones, proving the difficulty of applying a single algorithm in areas with such diverse forest composition and phenology. Hence, deeper research is needed to improve the generalization of this type of methods for different local conditions

3.2. RAIZ

MSF ABSTRACT TEMPLATE

Presentation title: Improving hydrological modelling with multi-resolution DEM input data

Authors with affiliation:

João Rocha (RAIZ), André Duarte (RAIZ), Margarida Silva (RAIZ), Sérgio Fabres (RAIZ), Ana Quintela (RAIZ)

Presentation type: Article

Date of publication: 2020

Journal/event: (to define)

Presentation focus on WP activity/task: 4

web link:

Abstract:*

Eco-hydrological modelling requires Digital Elevation Model (DEM) to better represent morphological surface and simulate catchment processes and responses. A DEM represents the earth surface and allows the extraction of the stream network automatically. In turn, a high-resolution DEM will result on a more accurate representation of terrain morphology, hydrologic data and linked processes.

In the Soil and Water Assessment Tool (SWAT), the DEM is a mandatory input for watershed delineation. This tool is a process based, semi-distributed river basin model that can be used to simulate continuous time landscape processes and catchment responses. A very high-resolution DEM will increase model performance and accuracy. For instance, will improve model robustness, the trustworthiness of simulation results, will increase calibration routines strength and reduce model uncertainty.

This work intends to evaluate the impacts of different DEM resolutions in hydrological responses using the SWAT. This model will be run for a Portuguese watershed (under MySustainableForest project) with four DEM resolutions, ranging from 30m (Shuttle Radar Topography Mission - SRTM), 10m, 1m (Synthetic Aperture Radar - SAR) to 0.5m (Light Detection and Ranging - LiDAR). The catchment is relatively flattened ranging from 100m to 160m. The available data (30m and 10m resolution) will limit actual catchment surface representation. Nevertheless, the SAR and LiDAR technologies support the creation on very high-resolution DEM. As a result, it is expected that SWAT performance will be improved with the highest resolution DEM and model simulations will be more accurate and with less uncertainty.

Presentation title: Eucalyptus Longhorned Borer attack assessment in industrial plantations using very high resolution images in Portugal central region

Authors with affiliation:

André Duarte (RAIZ), Luis Mota (RAIZ), Luis Muñoz (RAIZ), Margarida Silva (RAIZ), Sérgio Fabres (RAIZ), Catarina Gonçalves (RAIZ), Carlos Valente (RAIZ)

Presentation type: article, poster or presentation (to define)

Date of publication: 2020

Journal/event: Remote Sensing of Environment or Environmental Monitoring and Assessment (to define)

Presentation focus on WP activity/task: WP4

web link:

Abstract:*

The Eucalyptus Longhorned Borer (ELB) is an insect that attacks several species of *Eucalyptus*. This pest has caused significant economic damages in the last years. The severe drought that has reached the hottest regions of mainland Portugal has promoted the proliferation of this pest. Monitoring of affected areas, including dead trees or trees with symptoms of decline, is a very expensive and difficult task by traditional methods. Control is only effective when outbreaks are detected in an early stage and the infected trees are promptly removed from the stand to reduce pest populations. On the other hand, when large areas are already infested, clear cutting may be required. The main goal is to evaluate the location and extent of pest attacks through satellite images with different spatial and temporal resolutions as a decision-making tool for forest technicians and producers. Images from the Sentinel-2A / B, Spot-6/7, and Pleiades-1A / B satellites were used on areas where the pest attack has already been identified to validate models. Firstly, the analysis was performed by spectral vegetation index differences. Secondly, the COntinuous monitoring of Land Disturbance (COLD) using Sentinel time series was applied. Finally, the use of machine learning or deep learning techniques was tested to identify affected areas. The expected outcome is a methodology based on satellite images that could detect affected areas or individual trees in an early stage, thus providing better support to forest managers.

Presentation title: Evaluation of very high resolution remote sensing technologies in delivering information to Forest Management Planning of Eucalyptus stands in Portugal

Authors with affiliation:

Margarida Mendes-Silva (RAIZ), Mariana Stang (RAIZ), Luis Muñoz (RAIZ), André Duarte (RAIZ), Sérgio Fabres (RAIZ), (Supervisor from FEUC – Economics Faculty of Coimbra University)

Presentation type: article / poster / presentation (to define)

Date of publication: october 2020

Journal/event: Forest ecology and Management; Forest policy and economics; Journal of Environmental Management (to define)

Presentation focus on WP activity/task: WP4, T4.1 to T4.5 (D22 D4.2)

web link:

Abstract:*

Context: Forest managers frequently plan their activities based on little data and information at stand and tree levels. Products of information with high and very-high resolution from EO, combined with data from other remote sensing technologies and field data, could help the forest manager to improve their tactical and operational management planning. But, different combinations of data collecting systems could provide data with different value and more information has a cost and it is difficult for the forest manager to perceive and quantify the benefits in their decision process.

Aims: We aim to define what system or combination of sources of information increase the value of forest information and better fulfil the needs of information to support decisions in forest management planning.

Methods: Different alternatives of accessing and integrating *Eucalyptus* stands data in Portugal will be explored. The following data sources shall be considered in the analysis: conventional field methods, data collected with UAV's and data produced and available within the MySustainableForest Project (satellite and LiDAR data). Data and information will be used to support specific and relevant forest problems like control pests and estimate forest yield in *Eucalyptus stands*. The alternatives will be evaluated on their accuracy and precision, operational utility and efficiency and economic value. The alternatives will be evaluated using Multi-criteria analysis. We will consider the users and their knowledge in each context, something very relevant in the processes of decision making.

Expected Results: Demonstrate and quantify the benefits for the forest manager of use of products based on EO combined with field data and collected with other remote sensing technologies to support forest management planning.

3.3. CFRI

Presentation title: Operational sustainable forestry with satellite-based remote sensing

Authors with affiliation: Ivan Balenović (Croatian Forest Research Institute), Ivan Pilaš (Croatian Forest Research Institute), Luka Jurjević (Croatian Forest Research Institute), Dijana Vuletić (Croatian Forest Research Institute)

Presentation type: Oral presentation

Date of publication: 6 September 2019

Journal/event: Horizon 2020 Info Day - Space, Ministry of Science and Education
Donje Svetice 36, Zagreb, Croatia

Presentation focus on WP activity/task: WP6

web link: <http://www.obzor2020.hr/snippets/detail/340>

Abstract: HORIZON 2020 Info Day – Space was held in Zagreb at Ministry of Science and Education on 6 September 2019. After introductory presentations by representatives of Ministry and European Commission, we presented MySustainableForest project in general, its context and objectives, partners, demonstration sites across Europe, its main activities, etc. Special emphasize in presentation was given on activities conducting on two Croatian forest sites. Namely, in Croatia, there are two pilot cases / scenarios with different focus, but both are located in the continental lowland area. First, which is focused on timber production, is located in Pokupsko Basin forest complex, in the North-western part of Croatia. The area covers $\approx 12,300$ ha of the state-owned productive lowland forests. The second scenario focused on Climate/Hydrological Changes is in Slavonia region, in eastern Croatia. It encloses two lowland hardwood forest complexes; Našice lowland forests and Spa va Basin with a total area of $\approx 98,000$ ha.

Presentation title: Modelling and estimating height of lowland oak forests using various 3D remote sensing data

Authors with affiliation: Ivan Balenović (Croatian Forest Research Institute), Luka Jurjević (Croatian Forest Research Institute), Anita Simic Milas (Bowling Green State University Ohio), Mateo Gašparović (University of Zagreb, Faculty of Geodesy), Ivan Pilaš (Croatian Forest Research Institute), Ante Seletković (University of Zagreb, Faculty of Forestry)

Presentation type: Oral or poster presentation

Date of publication: 1-5 October 2019

Journal/event: The International Society for Ecological Modelling, Global Conference 2019, Salzburg, Austria

Presentation focus on WP activity/task: WP3 Service Development and Engineering / T3.4 Remote Sensing Algorithms, Models Tailoring and Data Fusion

web link: <https://www.elsevier.com/events/conferences/international-society-for-ecological-modelling-global-conference>

Abstract: Forests are the most widely distributed terrestrial ecosystem on the earth, and they provide many direct and indirect benefits for human society. Sustainable management of forests requires spatially explicit information about their state and development. These information are usually acquired through field-based forest inventories which can be very time-consuming and labor intensive. Remote sensing (RS) data present alternative which can reduce field work and improve the efficiency, but the accuracy of obtained results have to be carefully tested and evaluated.

The main goal of this study is to investigate the capability of various remote sensing data for use in forest inventory, with a special focus on estimation of plot-level mean tree height.

The study was conducted in the pedunculate oak forests of Pokupsko Basin complex located in Central Croatia. Ground-truth data were collected by field measurements of diameters at breast height and tree heights from a total of 105 systematically sampled circular plots with radii of 8 or 15 m. The mean tree height (Lorey's mean height) for each plot was calculated.

RS estimates of plot-level mean tree height were obtained from four different datasets: (i) Airborne Laser Scanning (ALS), (ii) stereo WorldView-3 satellite images, (iii) stereo aerial images, and (iv) stereo Unmanned Aerial System (UAS) images. Namely, point clouds were generated for each RS dataset and normalized with ALS digital terrain model. From each normalized point clouds and for each plot, various height and density metrics were extracted and calculated. These metrics were then further considered in the statistical modelling of Lorey's mean height as potential independent variables. RS estimates were evaluated with ground-truth data using leave-one-out cross-validation method.

As expected, ALS provided the highest accuracy, but all other RS datasets (satellite, aerial, and UAS images) confirmed the great potential for plot-level forest inventory.

Presentation title: Hand-held laser scanner (ZEB-HORIZON) – the possibility for application in individual tree measurements

Authors with affiliation: Ivan Balenović (Croatian Forest Research Institute), Luka Jurjević (Croatian Forest Research Institute)

Presentation type: Article in journal / magazine for popularization of forestry

Date of publication: May 2019

Journal/event: “Hrvatske šume” / “Croatian Forests” (journal / magazine for popularization of forestry)

Presentation focus on WP activity/task: WP5 Innovations and Roadmap

web link: <http://casopis.hrsume.hr/>

Abstract: The aim of this article was to present the possibility very new type of hand-held laser scanner (ZEB-HORIZON) for application in individual tree measurements (diameter at breast height, tree height, etc.). This research is ongoing and will provide first results on accuracies of its measurements. Moreover, the results will be compared with estimates obtained from airborne LiDAR, aerial and satellite images, as well as with Sentinel data used in MSF project.

Presentation title: Possibilities of the application of the medium-resolution Landsat 8 and the high-resolution RapidEye optical imagery in visualization and detection of changes in the forest cover by windthrows

Authors with affiliation: Dr. sc. Ivan Pilaš (Croatian forest research institute), Doc. dr. sc. Mateo Gašparović (Faculty of geodesy, University of Zagreb), Dr. sc. Martina Đodan, (Croatian forest research institute), Dr. sc. Ivan Balenović (Croatian forest research institute), Ivica Dugački, dipl.ing. (Croatian Forests Ltd, Forrest office Zagreb)

Presentation type: Article in journal

Date of publication: submitted

Journal/event: Journal of Geodesy

Presentation focus on WP activity/task: WP4 - Service Demonstration and Training Program Preparation, WP5 Innovations and Roadmap

web link: <https://hrcak.srce.hr/geodetski-list?lang=en>

Abstract: This paper presents a comparison of the satellite information of medium (Landsat 8, 30 m) and high (RapidEye, 5 m) resolutions for the purpose of examining the visual and quantitative estimates of wind damages and the renovation of the forest cover following the Theodor storm in November 2013 in Medvednica mountain, North-western Croatia. 3D visualization of the whole Medvednica area was derived from the Landsat 8 RGB channels of the visible part of the spectrum, pan-sharpened with the pan-chromatic channel on 15 m spatial resolution for visual forest damages detection. The spatial sensitivity of different satellite indices (NDVI, SAVI, MSAVI, NDMI, NBR, NBR2), based on Landsat 8 imagery, as a quantitative measure of the state of the vegetation cover, was investigated throughout the whole Medvednica area. From the investigated indices, the best detection of the changes in the forest cover was achieved by soil corrected indices such as SAVI and MSAVI in relation to the standard NDVI index. Indices based on the infra-red part of the spectra (NDMI, NBR, NBR2) showed quite good

performance in detection of the damages of the forest cover. By the comparative assessment on the chosen pilot area with severe windthrows near Bliznec, a significant advantage of the high-resolution RapidEye imagery in comparison with Landsat 8, was confirmed for the potential purpose of the more precise silvicultural subgroups delineation and monitoring of the success of the restoration of the young forest cover. Based on the obtained results, substantial possibilities of medium and high-resolution satellite imagery have been identified, both for the purpose of damages assessment after natural disasters and for the monitoring of the reforestation on these surfaces, which will be confirmed in the further course of this research. This research is performed as a part of the ongoing activities in the Horizon2020 project “My Sustainable Forest” with support of the Croatian science foundation projects GEMINI and 3D Forinvent.

Keywords: remote sensing, satellite observations, Landsat 8, RapidEye, forest damages, windthrows, forest restoration, Medvednica mountain

3.4. UFE

Presentation title: Use of the airborne laser scanning for forest variables estimation in spatially diversified forests

Authors with affiliation: Jaroslav Slepíčka (Faculty of Forestry and Wood Technology, Mendel University in Brno), Zdeněk Patočka (Faculty of Forestry and Wood Technology, Mendel University in Brno)

Presentation type: abstract od paper and poster at the conference

Date of publication: 28th November 2018

Journal/event: SilvaNet – WoodNet 2018, Student Scientific Conference

Presentation focus on WP activity/task: WP3

web link: http://is.mendelu.cz/dok_server/slozka.pl?id=108295;download=217315

Abstract:

The aim of the project is to verify the suitability of airborne laser scanning for estimates of forest variable in spatially diversified forests and to design a workflow for data collection and modelling. The project was implemented at the Training Forest Enterprise in three nature reserves (Coufava, U Nového Hradu and Rakovec). ABA method, designed for point cloud low-density, features and predictors are assessed from the laser derived surface models and point clouds, which are directly used for forest parameters estimation, typically using linear regression or k-nearest neighbour imputation method. They have been selected 70 plots with a radius of 25.24 m. On each plot, diameter in breast-height and heights of all trees were measured. The volumes of individual trees were calculated using the volume equations. Classified point cloud processing was performed in FUSION software (USDA Forest Service). Multivariate linear regression models were created in R for each forest variables. Models were validated using leave-one-out cross validation. For the estimation of forest stand volumes in particular forests stands, the LiDAR metrics of the whole point cloud must be calculated. The project demonstrated the suitability of using the ABA method for ALS data processing in spatially diversified forests. It is necessary to have a representative sample plots. Conventional measurements is time-consuming in spatially diversified forests. Forest variables estimates can be improved by using species-specific regression models, by using machine learning or combination with individual tree detection method.

3.5. FORESNA

MSF ABSTRACT TEMPLATE

Abstract submitted in cooperation with CFRI.

3.6. FOAL

MSF ABSTRACT TEMPLATE

No abstract submitted.

3.7. CNPF

MSF ABSTRACT TEMPLATE

No abstract submitted.

3.8. MADERA+

Presentation title: Patterns of variations of dynamic modulus of elasticity for different species

Authors with affiliation: Miguel Piñeiro¹, Oscar Santaclara¹, Federico Letourneau², Gonzalo Caballé², Angela Winck², Ciro Mastrandea², Ernesto Crechi², Aldo Keller², Hugo Fassola², Alejandro Martínez Meier², Esther Merlo¹

1: MADERA PLUS CALIDAD FORESTAL S.L. Spain

2: INTA (NATIONAL INSTITUTE OF AGRICULTURAL TECHNOLOGY). Argentina

Presentation type: Poster

Date of publication: (abstract book International Conference)

Journal/event: International Conference "Adapting forests ecosystems and wood products to biotic and abiotic stress" Integrating tools, methods and disciplines to face global change"

Presentation focus on WP activity/task: WP3

web link: <http://www.lestudium-ias.com/event/adapting-forest-ecosystems-and-wood-products-biotic-and-abiotic-stress>

Abstract:*

In forestry, understanding the development and variation of wood quality is important for different management and planning problems which can be broadly classified under (1) management for harvest operations, and (2) long-term silvicultural planning. Wood formation is a complex biological process that can be affected by the environmental site conditions, silvicultural management, etc. Nevertheless, different species have different ecological strategies related to their anatomical structure, tree characteristics and stand environment. This work is based on an extensive data set collected from 2010 to 2018, in 221 plots from four different Countries (Spain, Argentina, Portugal and Croatia), for 20 tree species (*Araucaria angustifolia*, *Astrocedrus chilensis*, *Celtis australis*, *Castanea sativa*, *Eucalyptus camaldulensis*, *Eucalyptus dunniis*, *Eucalyptus globulus*, *Eucalyptus grandis*, *Eucalyptus tereticornis*, *Eucalyptus viminalis*, *Juglans regia*, *Prunus avium*, *Pinus hybrida*, *Platanus hispánica*, *Pseudotsuga menziesii*, *Pinus ponderosa*, *Pinus radiata*, *Pinus taeda*, *Pinus pinaster* and *Quercus robur*). Individual basal tree diameters range from 5 to 102 centimetres and tree heights are in the interval of 3.80 to 52.30 meters. Stand ages vary from 5 to 94 years and values from stress wave velocity are in the range of 1480 to 6676 m/s. Predictive models of wood dynamic modulus of elasticity have been developed from tree and mass variables such as height, diameter, dominant height, site quality and number of feet per hectare, for each species. The results open a new way of predicting the technological properties of wood from tree and stand variables.

Presentation title: Effects of standing tree wood moisture variation on time-of-flight acoustic velocity in Pinus pinaster Ait. provenances tests.

Authors with affiliation:

Authors with affiliation: Esther Merlo¹ , Miguel Piñeiro¹, Oscar Santaclara¹, Hugo Fassola² , Francisco Lario³.

1 Madera Plus Calidad Forestal (maderaplus@maderaplus.es), España,

2 Instituto Nacional de Tecnología Agropecuaria (INTA) Argentina,

3 TRAGSA, Maceda España.

Presentation type: Poster

Date of publication: (abstract book International Conference)

Journal/event: International Conference “Adapting forests ecosystems and wood products to biotic and abiotic stress” Integrating tools, methods and disciplines to face global change“

Presentation focus on WP activity/task: WP3

web link: <http://www.lestudium-ias.com/event/adapting-forest-ecosystems-and-wood-products-biotic-and-abiotic-stress>

Abstract:*

Acoustic velocity is commonly used in breeding programs to select for stiffness. In most studies, the time of flight measurement is used directly to evaluate the genetics units. In this study we demonstrated that the acoustic velocity obtained in the tree is affected by the moisture content of the wood at the time of measurement. We have measured acoustic velocity, green density, basic density and dynamic modulus of elasticity, two times at different seasons in the same growing period in two 9-year-old Pinus pinaster provenance test. We found that the genetic parameters and variances associated to the site and the genotype environment interaction are different for acoustic velocity and dynamic modulus of elasticity. While there was a non-significant difference in acoustic velocity between sites; dynamic modulus of elasticity for site 1 was significantly higher than site 2. This suggests that depending on the parameter used in evaluate stiffness; a difference decision can be made. Therefore, practitioners should take care when extrapolation velocity reading of trees from different locations or season. For a rigorous study of the genetic parameters for wood stiffness, it is recommended to calculate green density at the time of measurement and, then, to calculate dynamic modulus of elasticity.

Presentation title: La calidad de la madera. Factor de valorización

Authors with affiliation: Esther Merlo Sánchez

Presentation type: Oral presentation

Date of publication: 8 de marzo de 2018. CEOE-CEPYME, Santander (Cantabria)

Journal/event: TALLER “EL INVENTARIO DE LAS MASAS PRODUCTIVAS DEL NORTE PENINSULAR. UNA HERRAMIENTA AL SERVICIO DEL SECTOR FORESTAL

Presentation focus on WP activity/task: WP6/1

web link: <http://www.redruralnacional.es/-/taller-el-inventario-de-las-masas-productivas-del-norte-peninsular-una-herramienta-al-servicio-del-sector-forestal->

Abstract:*

There are many factors that affect the quality of wood such as genetics, environment, light, water or forestry. It emphasizes that for the different species a zoning could be achieved with the different areas of quality since there are non-destructive methods that allow to measure these properties in order to allow, even from very small plants, to predict their evolution through predictive models. Esther Merlo considers that there is a challenge of competitiveness in which the quality of the raw material, in this case wood, conditions the future of the forest industry. He points out that it is necessary to go towards modeling since technology exists and the possibility of counting on it from now emphasizing that it is necessary to work in collaboration with the industry by characterizing according to the demands of the industry and to test with them the models developed, to obtain that the industry values and demands the previously characterized wood for specific destinations and that this differentiation by quality is reflected in the price.

Presentation title: Remote sensing technologies as proxy forecast of wood technological properties. Preliminary results

Authors with affiliation: Esther Merlo Sánchez¹, Miguel Piñeiro García¹, Óscar Santaclara Estévez¹, María Julia Yagüe Ballester².

1. MADERA PLUS CALIDAD FORESTAL S.L:
2. GMV

Presentation type: oral presentation

Date of publication: in preparation

Journal/event: 21st INTERNATIONAL Nondestructive Testing and Evaluation of Wood Symposium. September 24-27, 2019

Presentation focus on WP activity/task: WP6

web link: <https://ndtesymposium.org/>

Abstract:*

The forest industry seeks greater competitiveness. The spatial characterisation of wood quality attributes, such as density or the Modulus of Elasticity, increases the chances of optimising the wood added value chain through more efficient forest management plans. To date, several models for predicting the Modulus of elasticity and wood density have been developed at plot level, using field inventory data for various species. The team developed a prototype tool to estimate stand-level variations in wood and fibre attributes, suggesting the possibility of large-scale mapping for wood quality. Results showed links between wood fibre attributes and related variables regarding forest inventory data, obtained from satellite earth observation missions combined with other environmental variables describing climate and geography. The analysis has been carried out in the context of *MySustainableForest* project (H2020 No. 776045) which provides Earth Observation geo-information products across the wood sector to support the production chain from sustainable forest management procedures to wood quality entering sawmills, pulp mills or other transforming industries.

Presentation title: Analysis of the measurement moment on longitudinal stress wave velocity and dynamic modulus of elasticity

Authors with affiliation: Esther Merlo Sánchez, Miguel Piñeiro García, Oscar Santaclara Estévez

- Madera Plus Calidad Forestal S.L.

Presentation type: paper

Date of publication: in preparation

Journal/event:

Presentation focus on WP activity/task: WP6

web link

Abstract:*

Aim of study: to determine if the moment of measurement, in latitudes with different climatic seasons and, therefore, different physiological activity levels of plants (growing and dormant periods), influences the estimates of dynamic modulus of elasticity (MOEdyn). Area of study: The study was performed in Galicia, north western Spain. Material and Methods: pure *P. pinaster* stands. Main results: significant differences, at 0, 05% probability level, on stress wave velocity between the different periods were found. Nevertheless, when studying the effects on MOEdyn, any differences were shown. Research highlights: the results have demonstrated that stress wave velocity, measured using sonic methods, is highly influenced by physiological plants activity. In spite of this, MOEdyn analysis, which is also function of wood density, is not influenced by measurement moment, so results obtained for this structural value are equally good regardless the time year.

3.9. FOR A

Presentation title: Understorey identification through the generation of Canopy Base Height Models based on LiDAR data

Authors with affiliation: Saray Martín-García (Föra forest technologies SLL), Ivan Balenović (Croatian Forest Research Institute), Luka Jurjević (Croatian Forest Research Institute), Iñigo Lizarralde (Föra forest technologies SLL), Sandra Bujan (Land Laboratory, Department of Agroforestry Engineering University of Santiago de Compostela), Rafael Alonso-Ponce (Föra forest technologies SLL)

Presentation type: Oral or poster presentation

Date of publication: 1-5 October 2019

Journal/event: The International Society for Ecological Modelling, Global Conference 2019, Salzburg, Austria

Presentation focus on WP activity/task: WP3 Service Development and Engineering / T3.4 Remote Sensing Algorithms, Models Tailoring and Data Fusion; WP5 Innovations and Roadmap

web link: <https://www.elsevier.com/events/conferences/international-society-for-ecological-modelling-global-conference>

Abstract: The aim of this work is to find feasible methodologies to identify the canopy of understorey below a higher forest canopy using the information on vertical structure of vegetation that LiDAR point clouds provide. Canopy Base Height (CBH) identification could be the first step to extract understorey formations from LiDAR returns.

The study develops ad hoc CBH models as a previous phase to set the optimum heightbreak between LiDAR returns coming from tree canopy and from understorey. Canopy base height models have been built at individual-tree level, with tree size, competition indexes and stand variables as predictors. In the subsequent step, we have used two alternatives to obtain the understorey height model: 1) Tree-level approach, using each tree modelled CBH to derive return heightbreak; and 2) Plot-level approach, where a wall-to-wall model of the mean CBH in each cell is used to establish the optimum heightbreak.

Both methodologies have been performed on different LiDAR densities to check the precision of the models under diverse types of LiDAR data and to know which density of LiDAR returns is the optimal to build these models.

Our research shows that utilising CBH models can be useful to establish an optimum threshold to separate tree canopy and underbrush lidar returns. This methodology is able to separate the different formations in an irregular forest through their vertical distribution.

Tree-level results adjust better to the real stand conditions and offer a more realistic distinction between the returns that belong to the canopy and those that belong to the understory vegetation.

3.10. EFI

MSF ABSTRACT TEMPLATE

No abstract submitted.

END OF DOCUMENT



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776045

www.mysustainableforest.com